

2ND
Discussion Paper No. 9

ENERGY, WASTE & RESOURCE CONSUMPTION

Prepared for

The Regional Chairman's Task Force on
on Sustainable Development

by

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INTRODUCTION:

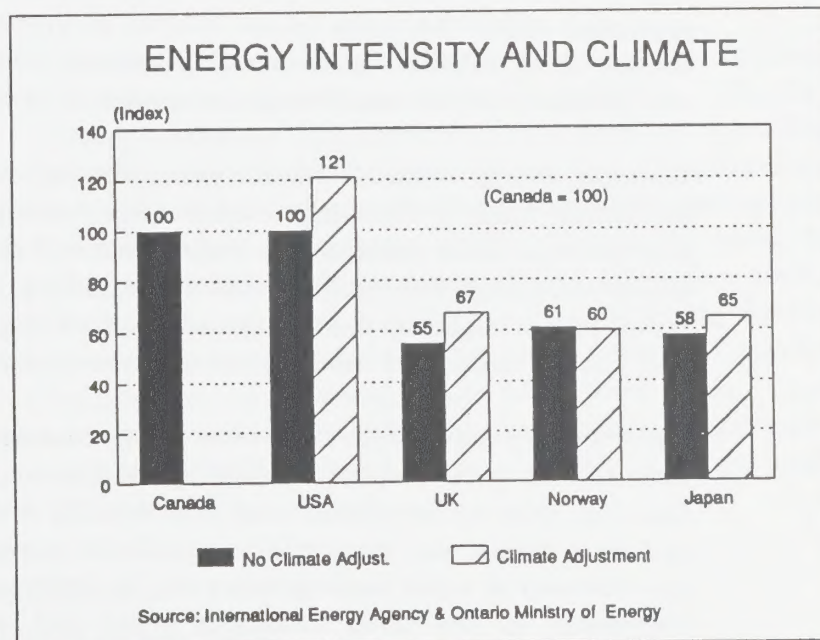
Three critical environmental issues, integral to the concept of sustainable development are energy, waste and resource consumption. The focus of this paper will present the facts respecting each of these issues, past and current practices and future possibilities regarding improvements. Where possible, the paper will focus on Hamilton-Wentworth.

1. ENERGY:

1.1 Energy Use:

Patterns of energy use may relate to local climate, industry mix, characteristics of the housing stock, building and construction practices, availability of public transit, urban design, broad patterns of land use, income levels, demographic characteristics, and consumer behaviour.¹ In Canada, energy use per unit of economic output is almost twice as high as Japan and major European countries due to differences in climate, a concentration of energy intensive industries such as pulp and paper and primarily metals, and differences in energy use in transportation, residential and commercial activities.²

Figure 1:



¹ Guide to Community Energy Profiling, Page 85

² Energy Security for Canada: Improving Energy Efficiency, Page 7

Concern over energy efficiency peaked in the 1970's as a result of concern over the cost and availability of energy sources in the international economy and Canada's reliance upon international sources to meet its energy needs. In the 1980's, price and supply of energy in the international economy largely stabilized, at least for the short term. However, security of supply remains an important issue. As well, the efficiency of energy use is linked to heightened concern over environmental issues in Canada and abroad, due to the problems associated with energy consumption and energy generation through oil exploration and extraction, and hydro developments.

Nationwide, the industrial sector accounted for 43% of all energy consumed in 1985. Transportation, residential and commercial uses account for the remaining 24%, 18% and 15%, respectively. The relative importance of industrial energy demand varies from year to year, depending on the level of industrial activity.

1.1.1 Residential:

The biggest component of residential energy use is space heating (67%). Water heating, appliances and lighting account for the remaining 17%, 14% and 2% respectively. These figures do not include the energy required to produce and dispose of materials used within and outside of the home.

High performance homes like the Ontario Advanced House can reduce energy consumed within the home to one quarter of that of a regular home. At another level, retrofit measures such as sealed windows, furnace tune-ups and insulation of hot water tanks can result in energy savings of 20 -30%.

Lowering energy requirements for space heating can result in significant dividends. Much of the energy used in space heating is lost through cracks and openings under doors and in walls, attics and chimneys. Caulking and weatherstripping, improved insulation, insulating or replacing windows, retrofitting or replacing heating systems and turning down thermostats are well known methods of reducing energy requirements for space heating.

Water heaters use at least 17% of the energy consumed by most households. Reducing hot water demands through quick showers, using the warm rather than hot cycle on the clothes washer and using cold water to wash hands and rinse dishes, etc., can result in significant energy savings. In addition, the efficiency of water heating tanks can be improved through lowering the thermostat on the tank, insulating pipes, and adding heat traps and additional insulation to pipes. Hamilton Hydro is developing a program to reduce energy used in heating water through providing customers with low volume shower heads, installing insulation on heaters and pipes, and checking thermostats on water heaters.

Appliances account for about 14% of residential energy use, and this proportion has increased over the last several decades as the proportion of households with appliances such as washers and driers, freezers and dishwashers has grown. However, the impact of additional appliances on overall energy use can be moderated by the availability of more energy efficient units and through the development of energy conscious behaviour. The Canadian Green Consumer Guide provides a number of hints, including: checking the fuel efficiency on Energuide labels, adjusting fridges and freezers to the most energy efficient temperature, testing door seals on fridges and freezers, turning off the pilot light and using matches for gas stoves, and minimizing use of air conditioners through alternatives such as tree planting, sunscreen blinds and low speed ceiling fans.

Between 1970 and 1985, energy use per housing unit declined by 23%, although overall energy consumption increased. The decline in per unit energy use has been attributed to an increase in the proportion of multiple units in the housing stock over the period, improvements in home heating and insulation systems in the existing stock, and conservation activities such as turning down thermostats and shutting off lights.³ Private sector, voluntary and government organizations have assisted in the understanding of energy issues through the dissemination of information on why and how to conserve energy. Also, the federal government provided funds for homeowners to convert from oil heating and to insulate their residence; Hamilton Hydro is preparing to introduce a program to lower energy required in water heaters.

There is evidence that the trends towards multiple unit housing, which was responsible for some of the gains in energy efficiency over the 1970's, was reversed in the mid 1980's. In Hamilton-Wentworth, the number of single detached units as a percent of all units constructed increased from 33% between 1976 and 1980 to 70% between 1981 and 1989 (CMHC). Moreover, the size of single detached units increased. Sixty-four percent of units constructed before 1981 were less than 1,300 square feet, compared to 14% of units constructed between 1981 and 1988.⁴ In addition to the trend towards larger housing units, the average number of persons per household has declined from 3.0 in 1976 to 2.7 in 1986. This trend has an impact upon the per capita energy demand which is not evident when examining trends in energy use per dwelling unit. On a more positive note, over the last ten years, the quality of insulation in new single family homes has doubled.

³ M.O.E.: Residential Energy Trends

⁴ Regional Municipal Building Profile

Fifty percent of residential energy requirements in Ontario in 1985 were met by natural gas, 15% by oil, 30% by electricity and 4% by other fuels. The importance of oil as a source of energy for residential use has declined dramatically as a result of higher oil costs and the availability of government grants to convert heating systems. Space heating with oil declined from 55% of Ontario households in 1970 to 20% in 1985. The use of both natural gas and electricity for space heating increased dramatically as alternatives to oil. Options such as high-efficiency condensing gas furnaces and electric heat pumps contribute to overall improvements in energy efficiency. About 25% of gas furnaces being installed in Ontario are high efficiency units. These high efficiency units are more commonly retrofits than installations in new homes.⁵

1.1.2 Commercial/Institutional:

Energy consumption in the commercial and institutional sector is the energy required to heat, light and run equipment in corner convenience stores, hospitals, warehouses, office towers and many other types of building. Heating and cooling accounted for about two thirds of the total energy consumed in the service sector in Ontario in 1985, lighting for 14% and water heating and equipment operation for the rest. Most of the energy consumed is related to the floor space of the building.

The Provincial Ministry of Energy has a number of programs to assist in increasing energy efficiency in older buildings. The Municipal Building Energy Efficiency Program assists municipalities in auditing and retrofitting municipal buildings⁶. In Stoney Creek, two arenas have been equipped with energy saving ceilings and other energy saving technologies, with resultant cost savings of more than \$ 8,500 per arena per year. The Cities Energy Forum provides advice and seminars to commercial building owners. The Energy Management and Conservation Program, delivered in Hamilton-Wentworth by the Hamilton Chamber of Commerce, reported over 15 million square feet under energy audit after three years. Various apartments, condominiums, hotels, office buildings, banks, restaurants and institutional and industrial buildings have been audited under the program in Hamilton-Wentworth.⁷

⁵ M.O.E.: Residential Energy Trends

⁶ The Ministry of Energy will pay 50% of auditing costs in municipal buildings. Only municipalities with populations of 50,000 or less qualify for cost sharing (50% Provincial grant) for retrofit costs. Municipalities with populations of 10,000 or less qualify for higher levels of Provincial grants for retrofitting.

⁷ Cities Energy Conservation Program

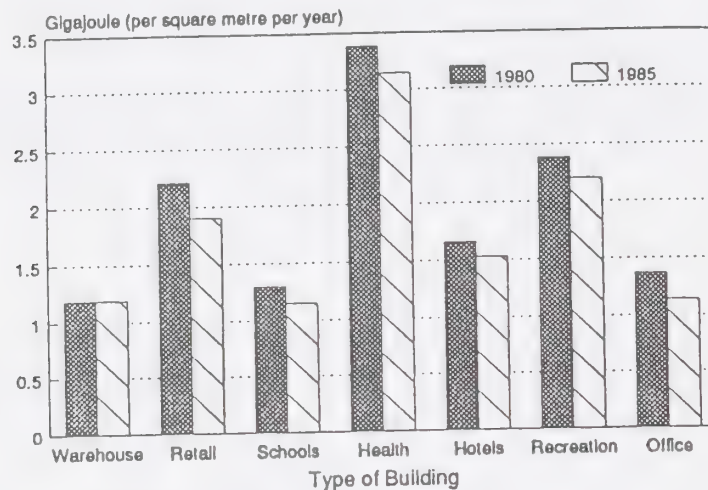
There is also potential energy savings in street lighting. Streetlighting accounts for approximately 35% of a local municipality's annual bill for all energy expenses. Ontario Hydro and the City of Hamilton are sponsoring a four year accelerated replacement program to replace remaining mercury lights with high pressure sodium lighting. The replacement program is expected to reduce the City's streetlighting power cost by approximately 26% or \$1.6 million annually.

Energy use varies considerably depending upon the age of the building. Many commercial and institutional buildings in Hamilton-Wentworth were constructed prior to the widespread concern over energy conservation which occurred in 1973. Energy levels in older buildings can be several times higher than in modern buildings unless energy conservation measures have been undertaken.

Energy use also varies according to the type of building. For example, health buildings, (e.g., hospitals, nursing homes), use large amounts of energy because of the use of specialized equipment, the around the clock nature of the service, and the need for relatively high room temperatures. The type of commercial/institutional buildings in a region depends upon the size and age structure of a population (e.g., need for schools and nursing homes) and upon economic factors (e.g., demand for shopping and recreational facilities and office space).⁸

Almost all categories of buildings improved in their use of energy per square metre of floor space between 1980 and 1985. This is due to improved efficiency of newer buildings and to conservation efforts in the sector. On a percentage basis, office buildings showed the greatest improvement (14%) in energy use per square metre of floor space. Government programs, aimed at improving energy efficiency in this sector, were made available in the 1980's to assist institutional clients in conducting energy audits, to provide financial assistance for energy auditing and retrofitting for a wide range of municipal buildings, to educate owners and managers of commercial buildings on opportunities for saving energy, and to demonstrate energy efficient technologies that could be applied in the sector.

⁸ M.O.E.: Trends in Commercial and Institutional Buildings

Figure 2:**ESTIMATED AVERAGE ANNUAL ENERGY USE**

Source: Ontario Ministry of Energy

Use of oil relative to other fuels in commercial buildings has declined, from 40% in 1970 to 13% in 1985. Natural gas became the heating fuel of choice increasing its market share from 32% to 54% over the same period. The share of electrical energy also increased, primarily due to the increased use of equipment such as computers and photocopiers. Alternative fuels such as solar water heaters have also made small gains in the commercial and institutional sector.

1.1.3 **Industrial:**

Hamilton-Wentworth has traditionally had a strong manufacturing base. For example, in 1981, manufacturing accounted for 19% of employment in Canada, 24% in Ontario and 33% in the Hamilton CMA. Approximately 38% of the manufacturing employment in the CMA in 1981 was in the steel industry and another 14% in metal fabricating.⁹ Between 1981 and 1986, employment in the manufacturing sector as a whole has declined by approximately 12%. Employment in the steel industry also declined.

⁹ Hamilton-Wentworth Economic Strategy

However, the regional economy still depends heavily upon the manufacturing base.

Two thirds of the energy consumed in the industrial sector is used to generate heat for the production process. The remaining energy goes into lighting, space heating and other uses.

Industrial energy use is directly related to industrial output, although the amount of energy required for a given output varies by industry type. Hamilton-Wentworth's largest industry, iron and steel, for example, uses large amounts of energy per dollar output. In this industry, the megajoules of energy per dollar of output declined from 12.7 to 12.1 between 1971 and 1985, or 5%. Over the same period, the megajoules of energy per dollar of output in all manufacturing declined from 5.8 to 3.9, or 33%. Improvements in energy intensity ratios are due to replacement of aging equipment, research to develop and apply new production processes, and education of employees on conservation ethics. The Ontario Ministry of Energy funds a number of programs to assist industries in: research, development, testing and initial demonstration of innovative energy technologies; identification and implementation of energy improvements in the manufacturing process; energy recovery from waste; and, introduction of cogeneration technologies.

TABLE 1:

Energy Intensity in Manufacturing:

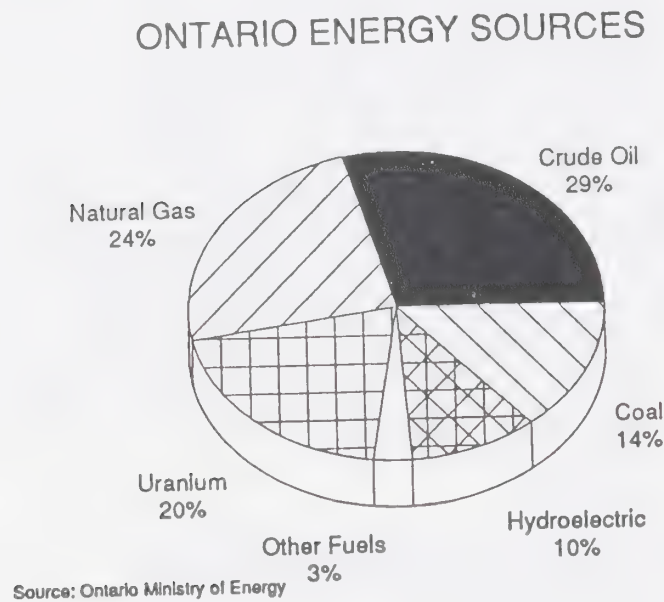
(Megajoules/1984 \$ of Output)

Energy Intensive Industries	1985			% Change	
	1971	1979	(Est.)	71-79	79-85
Lime	74.9	90.3	80.6	+20.6	-10.7
Cement	73.9	74.5	59.3	+ 0.8	-20.0
Industrial Chemicals	26.1	22.3	17.5	-14.6	-21.5
Pulp and Paper	29.1	27.5	20.9	- 5.5	-24.0
Abrasives	15.8	15.3	14.5	- 2.9	- 5.4
Smelting and Refining	53.0	52.3	26.2	- 1.2	-49.9
Iron and Steel	12.7	12.9	12.1	+ 1.6	- 6.2
 Less Energy Intensive Industries					
Agriculture	6.3	6.7	5.4	+ 6.3	-19.4
Aluminum Fabricating	4.7	4.4	6.0	- 6.4	+37.0
Plywood and Veneers	8.5	7.3	5.8	-14.1	-20.5
Animal Feeds	3.1	2.3	2.2	-25.8	- 4.3
Dairy Products	2.9	2.3	2.3	-20.7	0.0
Agricultural Implements	4.0	2.7	4.5	-32.5	+67.0
Rubber Products	4.8	4.5	3.8	- 6.3	-15.6
Mixed Fertilizers	1.1	0.8	0.8	-23.8	0.0
Motor Vehicle Parts	3.0	2.5	2.2	-16.7	-12.0
Paper Converters	2.6	2.5	1.7	- 3.8	-32.0
Textiles	4.9	5.4	3.7	+10.2	-31.5
Furniture and Fixtures	1.8	1.7	1.6	- 5.6	- 5.9
Cleaning Compounds	4.3	2.8	2.2	-34.9	-21.4
Electrical Equipment	2.4	1.9	1.6	-20.8	-15.8
All Manufacturing	5.8	5.1	3.9	-12.1	-23.5

1.2 Alternative Energy Sources:

A large proportion of energy used is obtained through the burning of fossil fuels or through nuclear reactors or large scale hydro electric projects. Renewable sources such as small scale hydro, solar, wind and vegetation are often more compatible with long term sustainability, although their potential for large scale use is limited in the short term.

Figure 3:



In 1985, oil accounted for 28% of energy used in the industrial sector in Ontario, natural gas for 31%, electricity for 15%, coal for 21% and woodwaste and other sources for 6%. Electricity was the only major fuel to increase its market share between 1973 and 1985. This increase was due to new technologies and applications which rely on electricity such as new process control, automation, and computer aided design and manufacturing systems. These new technologies are generally energy efficient and contribute to overall energy requirements per unit of output.

1.3 Community Energy Profiling:

Developing a community energy profile involves collecting data and making estimates on the amount and form of energy consumed, for what purpose, and at what cost. Trends, projections and local energy sources may also be examined. Assessments of the energy use pattern can then be developed. The Guide to Community Energy Profiling provides the following list of fuels, sectors and subsectors that tend to be included in a typical first round profile:

TABLE 2:**Fuels, Sectors, Subsectors and End Uses Recommended for an Initial CEP:**

Fuel	Sector	Subsector	End Use
Electricity Natural Gas Heating Oil Gasoline	Residential	Single-Family Detached Small Apartments Large Apartments Town/Row Housing	Space Heating Water Heating Space Cooling Other
	Commercial	Municipal Buildings Municipal Services Institutional Businesses	Space Heating Space Cooling Water Heating Lighting Other
	Industrial		
	Transportation	Municipal Fleet Private Automobile Other	

For the purposes of this paper, only hydro statistics were located. Table 3 on Page 12 summarizes some of the statistics on hydro usage available from the Ontario Hydro Statistical Year Book. Based on those statistics, some tentative conclusions may be made for Hamilton-Wentworth:

- Large commercial/industrial/institutional users accounted for 56% of hydro sales in Hamilton-Wentworth in 1987. Residential sales accounted for 17% and commercial/industrial/institutional sales of less than 5,000 kw accounted for 26%.
- All of the commercial/institutional/industrial customers using more than 5,000 kw/year are located in the City of Hamilton. The City accounts for 93% of all hydro sales in the Region. This is due to the concentration of large users and other customers located in the City.
- Residential hydro sales increased by 22% between 1981 and 1987 as a result of an 8% increase in the number of residential customers and an increase in monthly use by residential households in all Area Municipalities.

- Average monthly use by commercial/industrial/institutional users of less than 5,000 kw increased only moderately in most Area Municipalities between 1981 and 1987. Average monthly use decreased in Flamborough and increased in Stoney Creek.
- Hydro sales to commercial/industrial/institutional users increased by 5% between 1981 and 1987 due primarily to an increase in the number of customers.
- The City of Hamilton has the lowest average monthly use of hydro per residential customer. This may be due, in part, to the large number of apartments with centralized heating in the city.

Solar heating could, in principle, supply much of the low grade heat (e.g., for water or air heated to 140° Celsius) used in Canada. Low grade heat accounts for approximately 55% of total energy consumed. In practice, sunlight is an intermittent and diffuse energy source and equipment to capture, transfer, store and distribute solar heat is expensive for individual homeowners. In the United States, industrial systems account for about three-quarters of the market for solar collectors. Some studies suggest that multiple unit housing offers a better potential for the capture of solar heat in Canada. More applications will become practical as costs decline.¹⁰

Wind energy can be captured and transformed into mechanical motion. Due to the intermittency of wind, there is a need for storage. At a minimum, wind energy could provide an energy supplement to another source. Advances in materials technology, design and control systems could assist in the future development of wind farms.¹¹

Energy from biomass releases energy stored in vegetation such as forests, agricultural waste and crops. Wood waste provides the most important source of biomass used in energy production, and the forest products industry uses wood waste to supply a large proportion of its energy requirements. The Government of Ontario has encouraged this development through stricter enforcement of dumping and burning, and through loans and grants provided through the Northern Ontario Wood Energy Program. Solid waste also offers an alternative, and SWARU in Hamilton currently generates electricity and steam. Energy derived from this source is limited by the availability of inputs, the cost of plants, and concern over emissions.¹²

¹⁰ Canada as a Conserver Society

¹¹ Canada as a Conserver Society

¹² Parallel Generation in Ontario

Cogeneration refers to the process whereby electricity and thermal energy (steam, hot liquids or gases) are produced from a single energy source. Cogeneration can increase the efficiency of a fuel conversion system to 85%, compared to the 35% efficiency achieved in conventional power stations. The process has numerous applications in industry, institutions and commercial buildings.¹³

Parallel Generation is "the generation of electricity from equipment which is neither owned nor operated by a utility but which is interconnected to an electricity grid system".¹⁴ The source of electricity can be hydroelectric, wind, solar, biomass, etc. The electricity produced by parallel generators in Ontario can supply the needs of 500,000 residential consumers. Parallel generation has been supported by federal and provincial governments because of the potential to increase energy security as well as supply flexibility and diversity. Federal "off-oil" strategies provide for fast write-off of equipment used in some renewable energy technologies. Direct grants for demonstration projects may also be available. In addition, Ontario Hydro supports private parallel generation through the provision of technical information on opportunities and favourable pricing policies.

¹³ Parallel Generation in Ontario

¹⁴ Parallel Generation in Ontario

1981 Hydro Statistics - Hamilton-Wentworth and Area Municipalities

	Total Sales			Residential			General (under 5,000kw)			General (5,000+kw)	
	(000,000kw.h)	Customers	Mthly Use (kw.h)	Sales (000,000 kw.h)	Customers	Mthly Use (kw.h)	Sales (000,000 kw.h)	Customers	Sales		
Ancaster	23		1,279	1,042	16		126	4,675	7		
Dundas	117		5,517	849	57		721	6,636	57		
Flamborough	19		803	961	9		163	4,600	9		
Glanbrook											
Hamilton	5,352		105,509	590	745		11,251	10,126	1,365	13	3,211
Stoney Creek	264		10,659	789	97		1,240	9,553	163		
TOTAL	5,775		123,767		924		13,501		1,601	13	

1987 Hydro Statistics - Hamilton-Wentworth and Area Municipalities

	Total Sales			Residential			General (under 5,000kw)			General (5,000+kw)	
	(000,000kw.h)	Customers	Mthly Use (kw.h)	Sales (000,000 kw.h)	Customers	Mthly Use (kw.h)	Sales (000,000 kw.h)	Customers	Sales		
Ancaster	31		1,574	1,226	23		141	4,708	8		
Dundas	131		6,510	914	70		736	6,712	59		
Flamborough	22		918	1,089	12		184	4,484	10		
Glanbrook											
Hamilton	5,927		111,025	666	881		11,495	10,228	1,397	16	3,618
Stoney Creek	363		13,046	927	143		1,610	11,409	215		
TOTAL	6,474		133,073		1,129		14,166		1,689	16	

Hydro Statistics - % Change, 1981-1987

Hamilton-Wentworth and Area Municipalities

	Total Sales			Residential			General (under 5,000kw)			General (5,000+kw)	
	(000,000kw)	Customers	Mthly Use (kw.h)	Sales (000,000 kw.h)	Customers	Mthly Use (kw.h)	Sales (000,000 kw.h)	Customers	Sales		
Ancaster	35	23	18	44	12	1	14				
Dundas	12	18	8	23	2	1	4				
Flamborough	16	14	13	33	13	-3	11				
Glanbrook	NA	NA	NA	NA	NA	NA	NA				
Hamilton	11	5	13	18	2	1	2	23	13		
Stoney Creek	38	22	17	47	30	19	32				
REGION	12	8		22	5		5	23			

2. WASTE:

2.1 Some Facts About Waste:¹⁵

- In one year, Canadians collectively discard 24 million tires, 175 million spray cans, 300 million litres of waste oil, and 250,000 tonnes of soiled diapers.
- Canada disposes some 82% of its waste stream in landfills. By contrast, Japan manages to recycle or recover some 72% of its waste stream.
- The amount of solid waste placed in Ontario landfills in 1988 consisted of 3.4 million tonnes from approximately 3.6 million households, and 4.6 million tonnes from 40,000 commercial and industrial establishments. Ontario industry and municipalities also generate 1.4 million tonnes of sewage sludge annually and 2.1 million tonnes of construction and demolition wastes. The total amount of waste generated by Ontario is estimated at 11.5 million tonnes annually.
- Ontario municipalities spend approximately \$400 million annually to safely collect and dispose of the waste generated by households, institutions and business. It is expected that the cost of collection and disposal will increase substantially during the next ten years.
- Ontario generates somewhere between 3 and 4 million tonnes of hazardous waste each year. A large but uncertain percentage of this waste ends up in the environment without receiving adequate treatment.
- 90% of the domestic waste stream is composed of paper and paper products (36%), organics including yard and kitchen wastes (35%), glass (9%), metals (5%), and plastics (5%).
- The reprocessing of recycled materials uses a fraction of the energy requirements for the conversion of virgin materials into the same commodity products. Approximate energy savings for iron are 74%, aluminum 96%, rubber 74%, and certain plastics 90%.
- All industrial generators of waste in Ontario must characterize their wastes and register those that are liquid or hazardous. The proper management

¹⁵ These facts were obtained from:

- Challenge paper by the Ontario Round Table on the Environment and Economy, 1990.
- State of the Environment, 1990
- Closing the Loop, M.O.E., 1990

of liquid and hazardous industrial wastes, from generation to treatment and disposal, is monitored by way of a manifest system for transport into, out of, and within Ontario. Generators, carriers and receivers of liquid and hazardous industrial wastes must accurately complete the manifests and ensure that copies are sent to the Ministry of the Environment. There are nearly 20,000 registered industrial generators of liquid and hazardous wastes. In 1989, 1.3 million tonnes of industrial and hazardous wastes were manifested for transportation to licensed waste treatment and disposal facilities in Ontario.

- Currently, five operating energy-from-waste plants in Ontario incinerate approximately 400,000 tonnes of solid waste annually. As well, approximately 135 hospitals have on-site incinerators for the disposal of biomedical wastes. While incineration can reduce incoming solid waste by up to 95% by volume, it requires controls on air pollutants. It also produces potentially hazardous bottom and flyash which may require treatment prior to disposal.
- On an average, residents of Hamilton-Wentworth produce 19 kg of solid waste per person per day or 332 kg per person per year, (excludes commercial and industrial wastes).
- The scrap equivalent of 11 million passenger car tires is generated each year in southern Ontario. Approximately 25% are recycled or reused, and 65% of the scrap tires are placed in landfills. The remainder are stockpiled.

2.2 The Region of Hamilton-Wentworth Solid Waste Management System:

The Region of Hamilton-Wentworth consists of the municipalities of Ancaster, Dundas, Flamborough, Glanbrook, Hamilton, and Stoney Creek. During 1989, the Region's Solid Waste Management System was required to satisfy the waste disposal needs of about 440,000 people, who collectively produced about 302,685 tonnes of residential, industrial and commercial waste. To properly deal with this amount of waste, an integrated system approach has been adopted.

The Region's Solid Waste Management System contains two main elements;

- (1) The Waste Disposal System consists of three Transfer Stations, SWARU, and the Glanbrook Landfill, and is operated by Laidlaw Waste Systems under contract with the Region. Residential waste collection is the responsibility of each area municipality, while waste disposal is a function of the Region.
- (2) Resource Recovery Programs, including the blue box recycling program, the backyard composting program and the household hazardous waste disposal program.

2.2.1 Solid Waste Reduction Unit (SWARU):

A portion of the Region's garbage goes to an energy-from-waste (EFW) plant that generates electricity for sale to Ontario Hydro. Up to 450 tonnes of waste can be received each day. Waste volume is reduced up to 95% through incineration and metal separation. The bottom ash produced goes to the Glanbrook Landfill while the fly ash goes to a secure landfill in Sarnia. Emission standards are met through the use of a spray tower - baghouse system.

Approximately 60% of municipal solid wastes are received at SWARU and become "refuse derived fuel" (RDF) for the facility. In 1982, a turbine generator was installed at SWARU making the plant the first in Canada to produce electrical energy from municipal waste. In 1986, the pollution control system at the facility was upgraded and recent testing has indicated that SWARU emissions are within M.O.E. air emission regulations. Process changes in the pollution control system are planned for 1990-91 to improve air emissions further.

In 1989, a total of 93,707 tonnes of solid waste was processed through the Solid Waste Reduction Unit. A total of 4,997 tonnes of magnetically separated ferrous material were extracted. Just under half of this metal was sold to local industries. In 1989, the SWARU process also resulted in 26,901 tonnes of incinerator ash being disposed of at the Regional landfill site in Glanbrook.

TABLE 4¹⁶EXISTING REGIONAL WASTE DISPOSITION* (in tonnes per year)

(1)	Municipal Collection	192,000 tpy
(2)	SWARU Waste Stream	108,000 tpy
(3)	Process Diversions	21,000 tpy
(4)	SWARU Waste From Transfer Stations	1,000 tpy
(5)	Actual Waste to SWARU Process (2 - 3 + 4)	87,000 tpy
(6)	Municipal Collection to Landfill (1 - 5)	105,000 tpy
(7)	Commercial/Industrial Collections and Private Vehicles	118,000 tpy
(8)	Sewage Grit	1,500 tpy
(9)	SWARU Ash and Rough Waste	23,500 tpy
(10)	Total Landfill	249,000 tpy

* Based upon 1987 - 1988 Regional data, rounded off to nearest 1,000 tonnes.

¹⁶ Source: Solid Waste Routing Strategy, W.C.I. Waste Conversion Inc., July, 1988

TABLE 5¹⁷SWARU OPERATIONAL ANALYSIS

- Nominal capacity = 550 tonnes/day
- Average annual daily capacity @ 80% availability factor ** = $550 \text{ tonnes/day} \times 80\% = 440 \text{ tonnes/day}$.
- Annual throughput capacity @ 5 days/week delivery = $440 \text{ tonnes/day} \times 5 \text{ days/week} \times 52 \text{ weeks} = 115,000 \text{ tonnes}$.
- Annual throughput capacity @ 6 days/week = $440 \text{ tonnes/day} \times 6 \times 52 = 137,000 \text{ tonnes}$.
- Annual throughput capacity @ 7 days/week *** = $440 \times 7 \times 52 = 160,000 \text{ tonnes}$.

** Plant availability factor is applied against the days of operation on which refuse is available for delivery into SWARU for processing.

*** 7 days/week operation does not necessarily entail non-stop operation, as the 80% availability factor considers one day out of five for downtime.

¹⁷ Source: Solid Waste Routing Strategy, W.C.I. Waste Conversion Inc., July, 1988

2.2.2 Glanbrook Landfill Site & Regional Transfer Stations:

The Region's landfill is located at 1500 Haldibrook Road in Glanbrook Township. This engineered site covers 530 acres, of which only 250 will be used for landfilling. Solid waste is received from:

- (a) Waste generators in the Region, via the transfer stations only (the site is not open to the public).
- (b) Bottom ash from SWARU.
- (c) Grit from the sewage treatment plant.

The site is subject to a continuous and comprehensive monitoring program which includes leachate control, surface water retention and ground water sampling.

The 537-acre landfill has a total waste handling capacity of 6.2 million tonnes or approximately 500,000 cubic yards and is located in the south-eastern corner of the Region. Assembling the land and preparing the site and roadways cost the Region \$3,640,000, a sum that will be depreciated over the landfill's estimated 30 years of operation.

According to current Regional Engineering figures, the quantity of garbage disposed of at the Regional landfill in Glanbrook reached a peak of 282,046 tonnes in 1986. This was during a period when the SWARU was undergoing modifications. Since 1986 the total volume steadily declined, with the Regional landfill receiving 249,448 tonnes in 1987; 235,298 tonnes in 1988; and 228,688 tonnes in 1989.

The most important area of waste source reduction appears to be in the area of standard residential, commercial and industrial wastes (as opposed to deliveries of SWARU ash and Sewage Treatment Plant grit), and this source has declined in weight of deliveries from 273,829 tonnes in 1986 to 197,818 tonnes in 1989.

Three Regional facilities (2 in Hamilton and 1 in Dundas) have been established to receive and compact waste for transfer to the Glanbrook landfill site. Transfer Stations are open to the public, industry, and business for disposal of solid waste. Disposal of quantities of more than 300 kilograms (660 lbs.) is subject to a charge based on tonnage, applied to the entire load. The current rate is \$150/tonne. There is no charge for quantities less than 300 kilograms, but a deposit is still required.

Acceptable Waste includes general residential, commercial, industrial and municipal refuse, appliances, furniture, yard waste, kitchen waste, and most articles under 4 ft. in length.

Unacceptable Waste includes construction/demolition debris, soil, concrete, wood products over 4 ft. in length, dead animal, heating oil tanks, any liquids, hazardous waste, tires from industrial/commercial generators.

In addition, there are three bins at each transfer station that accept specified recyclable goods, scrap metal, and propane tanks (valves removed).

2.2.3 OTHER LAND FILL SITES:¹⁸

Perhaps the most controversial aspect of the private sector initiatives in the waste management business is the operation of landfills. While private sector efforts to manage wastes through recycling are almost universally well-received by the public and various levels of government, the management of landfills by profit-motivated firms is rarely accepted by environmental groups, members of the public or local governments as being an activity beneficial to the local community.

South Quarry Landfill:

Steetley Quarry Products Inc. proposes to develop a 78 hectare non-hazardous industrial landfill with a life-span of about 10 - 13 years. The proposed landfill would be on the 135 hectare South Quarry site close to the existing Brow Landfill Site but on the north side of Highway 5.

This site would be the largest of its type in Canada. According to the proposal, residential and industrial waste will be accepted at the proposed facility from sources outside the region and from the Greater Toronto Area. Given that Steetley has another 200 acre quarry just to the north, there are fears that if this proposal is successful, this site also will be proposed for use as a landfill. The project requires the preparation and approval of an Environmental Assessment (E.A. Act Section 34 (b)). This assessment includes social, noise, traffic, dust and other environmental impacts. On September 12, 1989, Steetley released a draft E.A., "Steetley South Quarry Landfill Development Draft E.A.", for review by local residents, interest groups and authorities.

¹⁸ Refer to Report on State of the Environment, 1990

Regional Council has authorized the hiring of a consultant to examine the documentation and technical arguments presented by Steetley in order to assist Council prepare its position.

Brow Landfill Site:

One such controversial private-sector landfill that has been in the public eye in recent times has been the Steetley Industries proposal to change the contour of its brow landfill site. If accepted, the proposal would allow for a greater volume of waste to be dumped there than was allowed under the initial Certificate of Approval issued by the Ministry of Environment. This point is debated by the various parties involved.

The Escarpment Brow Landfill Site is in the Town of Flamborough and located just above the escarpment near the boundary with Dundas. Given a permit by the Ministry of the Environment to operate a landfill in an abandoned quarry in 1978, Steetley Quarry Products applied for an amendment to its certificate in 1988 that would allow the company to accept waste from areas outside of Hamilton-Wentworth and adjacent regions. M.O.E. allowed an interim extension of the service area under the Certificate of Approval and Steetley began to accept wastes from a number of waste disposal contractors in Peel Region and Metropolitan Toronto.

The company argues that it can continue to accept new non-hazardous solid wastes without any adverse conditions to local groundwater or nearby residents. The Towns of Dundas and Flamborough oppose any new waste deposits at the landfill. Residents believe that additional wastes could lead to the company pumping excessive amounts of leachates from its groundwater-protection system to the Dundas sewage treatment plant or to other leachate-related problems to adjacent properties.

The Region has withdrawn support for the proposal on the basis that guaranties must be made by Steetley Quarry Products that no attempt will be made to dump more waste in the landfill than had been proposed in 1978 and that any increase in the amount of leachate resulting from the operation of the landfill should be dealt with before reaching the Dundas sewage treatment plant. Plans to continue dumping waste from outside of Hamilton-Wentworth into the landfill are not supported by the Region. The Region would prefer to see wastes only from this area dumped there. The fear is that otherwise the landfill will reach capacity quickly with wastes from elsewhere thereby leaving Regional waste-generators with nowhere to dump their non-hazardous solid waste. In principle, the Region has taken the view that each region should deal with its own garbage.

2.2.3 Recycling:

Curbside Recycling has been developing in the region since 1977. Curbside recycling has progressed from bi-weekly collection of newspaper, to Blue Box programs in all six area municipalities. In 1989, 14,987 tonnes of newspaper, glass containers, aluminum and steel cans, and PET plastic soft drink containers were collected from approximately 110,000 households across the region.

The Region plans to build on the success of current recycling activities. Therefore, it has solicited proposals for the provision and delivery of an expanded recycling program, that currently has as a primary objective the meeting the provincially-mandated targets of a 25 percent reduction of waste by 1992 and a 50 percent reduction of waste by 2000. The request for proposals has been divided into two segments; the Phase 1 Request for Proposals that addresses the need for recycling in the traditional municipal waste collection sector; and the Phase 2 Request for Proposals that addresses the need for recycling by industrial and commercial concerns that have their waste disposal sites. The Region sees a need to expand recycling in a number of areas, and optimistically looks to the possibility of eventually recycling up to 50,000 tonnes a year.

In addition to expanding the Blue Box recycling program to include apartments, rural areas, small businesses, offices and institutions, the Region foresees the recycling of large quantities of wood, corrugated cardboard and paper as well as the initiation of a municipal composting program. The Region also intends to more stringently enforce the by-law that prohibits development and renovation firms from disposing of "non-acceptable" wastes such as construction and demolition debris at municipal waste disposal centres.

It has been estimated that recycling corrugated paper could reduce landfill requirements in the Region by 8,000 tonnes annually or 3 percent of the current landfill waste stream. Diverting wood would probably result in a reduction of landfill requirements of the same magnitude again, assuming that improved waste stream control would effectively eliminate larger deliveries of wood debris.

In order for the present expansion of recycling programs to continue to be as widely supported as they are presently, proposals for recycling programs in Hamilton-Wentworth will have to be cost-efficient. The rapidly expanding costs of disposing of wastes in landfills or through incineration will increasingly make recycling the logical means of waste elimination both from a financial as well as environmental viewpoint. In the past it was not

expected that traditional waste disposal methods pay their own way, it is probably unrealistic to expect recycling programs to necessarily operate on a full cost-recovery basis.

Although the public sector is primarily responsible for waste disposal and recycling in the Region, a number of important activities are carried on by the private sector. There are four privately licensed landfill sites in the Region. Scrapyards, the beverage producers and numerous other private sector industries are heavily involved in the recycling of materials such as newspaper, glass bottles, plastics, metal cans, corrugated cardboard and old cars that would otherwise be considered waste.

2.3 Hazardous Waste:

A growing scarcity of land available for development close to downtowns and the deindustrialization of central urban areas in North America led to proposals for reusing traditional industrial lands for residential, commercial and institutional activities.

Municipalities throughout North America have become accustomed to routinely rezoning lands in central locations from industrial to other uses. The consequences of these actions can be unfortunate, largely because of a lack of understanding of the possible effects of deposits of materials such as liquid chemicals or heavy metals on residents and building occupants above these deposits.

Recent experience with transitions from 20th Century industrial sites to residential or institutional developments has proven this to be the case. Infamous cases such as the residential development at Love Canal have illustrated the potential of chemical residues left behind by industrial activities to threaten the health of individuals unlucky enough to purchase homes on or adjacent to old industrial areas. New schools, apartment buildings, houses or offices built on land that contains chemical wastes or landfill sites pose a health threat to the community.

An associated problem, that is growing in magnitude now that sophisticated devices are increasingly capable of detecting small quantities of toxic materials in samples of water or air, is the potential for contamination of residents of areas adjacent to industrial activities. It is now apparent that properties have become contaminated as a result of chemical discharges into groundwater, soil, or as a result of lead emissions from automobiles along busy highway routes.

Companies, municipalities and individuals examining the potential purchase of a piece of real estate must now evaluate whether toxic materials were at

one time deposited on the individual property in question and also whether or not toxic materials have been or could be deposited on the property from adjacent areas.

Materials such as paint, antifreeze, turpentine, batteries, smoke detectors, disinfectants, rodent poisons, insecticides, used motor oil, polishes and paint thinners, and oven cleaning solutions should not be mixed with standard residential solid wastes. When deposited in large quantities in landfills, these seemingly small quantities of common materials can produce a toxic brew as the chemicals mix together with rain water and then seep into nearby groundwater. Leachate collection systems are now a standard feature of new landfill sites, however, these leachates must then be dealt with as toxic waste. This leachate can be pumped to the Sewage Treatment Plant or simply pumped back into the landfill.

The leachate monitoring program at the Glanbrook Regional Landfill site has so far determined that no problems with migrating leachate now exist. The Region is also monitoring and collecting leachate from the former Upper Ottawa Street landfill site.

Leachate collection systems are not in place at each old Landfill site in the region, some of which are adjacent to creeks. By 1980, the ten landfill sites inherited by the Region when it was formed were closed to M.O.E. standards. A monitoring program of the abandoned sites was initiated to warn of the emission of excessive gases or leachates. The Ministry of Environment is currently reviewing a consultant's report on testing procedures for the old landfill sites.

Household Hazardous Waste Programs provide the average citizen the opportunity to dispose of dangerous chemicals, oils and various paints without mixing these substances into their garbage or into nearby sewers. The Region successfully conducted six household hazardous waste sessions in 1989 in which residents of Hamilton-Wentworth were able to dispose of dangerous or toxic household materials at a predetermined drop-off point. People filled 257 forty-five-gallon drums with hazardous wastes ranging from paints to arsenic. Regional Council has approved the establishment of a permanent Hazardous Waste Depot which will open each weekend for citizen use.

In addition to historical industrial activities, illegal dumpsites on agricultural lands have been identified as a cause of contamination. Agricultural lands can become contaminated due to the use of chemicals in the farming process or due to 'back 40' dumpsites where containers of pesticides and/or other hazardous materials were disposed of improperly or illegally. Consequently, virtually any existing land use may be associated with a contaminated soil

site, either as a result of ongoing activities or as a result of activities that took place years or decades before.

Within Hamilton-Wentworth, a number of sites have been publicly identified as contaminated: the Hamilton Street Railway site, the Lax properties and the Upper Ottawa Street Landfill site and six coal tar sites. In each case the source of the contamination differs.

Heavy metals contaminate the Lax site and the cost of site cleanup has been estimated at approximately \$9 million. A particular concern with the Lax site is the occurrence of off-site transportation of these materials into the harbour in either the groundwater or in surface runoff. The Province has recently announced that the funds for the clean-up are now available.

The third major site that may hold contaminated soil is the Upper Ottawa Street Landfill. This landfill site accepted both solid refuse and liquid industrial waste and was closed and capped in 1980. A gas system flare-off has been installed on the site to deal with gases. This site is governed by all of the relevant regulations in the Environmental Protection Act regarding the redevelopment of old landfill sites. The range of possible contaminants present has not been determined but mitigating measures have been implemented to minimize the impact on the surrounding environment. Leachate testing has just been boosted by the Region. There are 10 other old landfill sites which were shut down by the Region to MOE standards.

2.4 Conclusion:

The storage, elimination or disposal of solid wastes is the responsibility of the Region and as a result, Hamilton-Wentworth maintains a number of services and operations related to waste management. The Region of Hamilton-Wentworth has attempted to address the problem of waste disposal by preparing long-range plans to deal with waste produced within the Region's boundaries and by setting up, or supporting, various organizations and processes to reduce the need for landfilling. Emphasis has been placed on incineration, recycling and recently municipal composting as ways to reduce the need for landfilling.

A co-operative effort between industry, commerce and citizens is necessary to ensure that the amount of residential waste is reduced, that objects that can be recycled are recycled, and that dangerous or toxic materials that cannot be recycled are given to local authorities in separate containers at the times when the Region offers its special waste disposal programs.

Ultimately, reduction and reuse are primarily the responsibilities of the people that purchase and consume products that generate garbage in the first place. The convenience and successful marketing of a disposable

lifestyle has become an expensive problem for municipalities. Advances in recycling technology, or manufacturing processes that use less original materials, will help reduce overall garbage levels. However, to deal with the high general level of consumption consumers will have to show the producers of consumer goods that they value durability and are willing to pay for it.

3. RESOURCE CONSUMPTION:¹⁹

3.1 WATER:

3.1.1 - Regional System:

During the past half century, water and sewer utilities have undergone transitions. Growing communities throughout Canada built bigger and bigger water and sewer systems to accommodate the growth in urban areas. Areas like Hamilton-Wentworth found themselves with an almost limitless supply of fresh water and were capable of handling all sewage produced in the municipality.

Water was not considered a natural resource, but its presence was necessary to stimulate economic growth. Water resources are limited even in the Canadian context, either through straight forward supply shortages, through degraded water quality or indirectly through capital program constraints.

Hamilton-Wentworth is located on the shore of one of the largest fresh water systems in the world. The Water Purification and Sewage Treatment facilities were built to service the needs of the growing population as well as the industries that were locating in this area.

Due to the increasing cost of water and the coupling of water charges to sanitary sewer charges, many large industries in the Region have done intensive reviews of their water demands and have managed to reduce their Regional water requirements significantly. As a result, the Region is not presently experiencing a capacity problem with water supply or sewer treatment but capital requirements to increase capacity and quality will require consideration in the near future.

Traditionally, agencies devoted to water management have focused almost exclusively on the delivery and treatment of adequate supplies and the collection and treatment of waste water. Meeting expanding demand without repairing leaks or encouraging users to be more efficient with existing supply is a very costly way of dealing with the problems.

¹⁹ Refer to Water Demand Control Strategy, August, 1989

New approaches to water problems include a change in thinking and emphasis to a more conservation oriented belief of using the water required more efficiently without drastically affecting the quality of life. The need for this kind of approach is inescapable in the face of evidence of increasing ecological damage and the cost of maintaining or expanding the existing water and sanitary sewer systems.

As the availability of water alters and demands shift, conflicts between water users will increase. The availability of water and its quality will be recognized as a key determinant of economic and environmental health. To avoid reliance on forced response under crisis and to anticipate and prevent problems requires that the necessary policies for water and sewer management are put in place now.

On an average day, each resident of Hamilton uses approximately 360 litres of municipally treated water for toilet flushing, bathing, washing clothes, and watering lawns. Only 4% is used for drinking and cooking. Compared to people in other developed countries, Canadians rank second highest (behind Americans) in terms of per capita water use (see Table 1). In France and West Germany, for example, the amount of water used per person is less than half of that which is used by Hamilton Harbour basin residents. By comparison daily water usage in many parts of Africa or South America, where water is supplied through a public hydrant, ranges between 20 and 70 litres per person per day (Postel, 1984).

Table 6: Comparison of Municipal Domestic Water Use
(per capita)

COUNTRY	WATER USE (Litres/day)
United States	425
Canada	360
Sweden	200
United Kingdom	200
West Germany	150
France	150
Israel	135

(Source: Postel, 1984)

Water prices in Canada have generally encouraged high water use. Relative to other developed countries, Canada has one of the lowest municipal water rates (see Table 2). Canadians pay about one quarter of what Europeans pay for water, and about half the American rate. Usually, the cost to users includes only the cost of treatment and distribution. In contrast to most other natural resources, no commodity charge is placed on the water itself. Pricing policies also tend to undervalue instream uses.

Table 7: Comparison of International Water Prices
1986 (\$US/m3)

COUNTRY	PRICE
Australia	\$0.78
Germany	0.78
Belgium	0.77
France	0.63
United Kingdom	0.39
United States	0.37
Sweden	0.34
Italy	0.26
Canada	0.18
Italy	0.17

(Source: AWWA Mainstream Sept. 1986)

One potential danger to the drinking water of Hamilton-Wentworth's residents in rural areas unserved by Regional water lines is seepage of petrochemicals from underground storage tanks into groundwater. For example, a buried gasoline tank at the corner of Mohawk and Garth Streets has leaked and fuel is being pumped from the ground. Nearby homeowners have experienced fumes and odours.

The Province has required every owner of a tank installed prior to 1974 to give each tank anti-corrosion treatment, i.e. replacement or recovering the metal tanks with fibreglass materials. The deadline for this treatment is December 1990.

Because the majority of large Canadian urban areas are able to obtain their water supplies from rivers or lakes, little attention is paid to the capacity of buried fuel tanks to contaminate large numbers of groundwater wells. One litre of gasoline can contaminate over a million litres of drinking water. Methods of combatting groundwater contamination through delayed intervention are both costly and often ineffective. As a result, most European countries have very strict regulations concerning fuel tank leakage and petrochemical spills. Gasoline stations must regularly reconcile delivery and sales records so as to ensure that leakage is not taking place, and new underground tanks must be certified as being corrosion-resistant. Attempts are made at identifying old tanks and digging them up to ensure that long-forgotten fuel storage tanks do not contaminate future groundwater supplies.

3.1.2. - Groundwater

Historically, the quantity and quality of water supply from aquifers has not been a major problem in Hamilton-Wentworth. However, this may be due to a lack of information on drinking water from groundwater sources. Where problems have existed, the region has taken steps to ensure adequate water supply. There have been some isolated instances where groundwater supply has been contaminated and either the region has agreed to pipe water into an area (e.g., Pleasant View in Dundas); establish a communal water supply (e.g., Lynden); or, improve the existing communal supply by chlorination (e.g., Carlisle).

Generally speaking, the issue of water quality is the responsibility of the Regional Medical Officer of Health. There is some overlap of jurisdiction in the supply of water between the Region of Hamilton-Wentworth (Engineering Department) and the Ministry of the Environment.

Potential threats to ground water supply and quality include:

- agricultural use of pesticides leaking through the soil and into the water supply.
- old buried fuel storage tanks which are deteriorating.
- old landfill sites.
- additional development in rural areas straining available resources.

3.2 SEWAGE DISPOSAL.²⁰

3.2.1 - Regional System:

The main sewage treatment plant, located at Woodward Avenue has a capacity of 490,000 m³/days for complete treatment. In 1990 the average daily sewage flow was 401,500 m³/day.

The primary treatment phase of the present facility was built in 1964, the secondary treatment phase in 1975 and a third extension to increase the capacity of the plant in 1980.

The plant consists of two main process streams: Liquid and Solid and also incorporates a major incinerator complex to dispose of sewage sludge.

²⁰ Refer to Report on the State of the Environment, 1990

Some people dump liquid waste into the sewer system without a thought as to the consequences. However, the sewage treatment process that "treats" their waste does not remove most of the toxic household materials. Many industrial and commercial firms routinely or occasionally discharge hazardous substances into the municipal sewage system. These substances very often continue on through the sewage treatment plants' processes intact and end up in the Great Lakes. This situation is repeated all around the Lake. In the long-run our common water sources become polluted and unusable, and our fish and wildlife resources dissipate.

Accurate records showing the types and volumes of different forms of pollution being dumped into the sewage system before 1987 do not exist. Thus, it is difficult to be specific about just how severe the problem is and whether or not the situation is getting worse. Records have been kept on the discharge of ammonia, phosphorus and suspended solids. Also on record, is the total discharge of wastes into Hamilton Harbour from the Woodward Avenue and Dundas plants. It is difficult to infer from this data just how extensive the problem of liquid waste is because of the lack of records on toxic material discharges to the sanitary sewer system.

The Woodward Avenue treatment plant, located on Red Hill Creek, discharges on average, over 7,000 kilograms of contaminants daily. Much of this waste is ammonia, phosphorus, and other relatively non-toxic wastes collected throughout the system in Hamilton, Stoney Creek and Ancaster; however, a substantial amount of it will be toxic industrial and household chemicals or compounds. Until quite recently, no concerted attempt at determining just what compounds comprised this mixture of industrial and residential sludge was made.

The volume of industrial chemicals discharged into the sewage system regularly or accidentally is unknown. Results from extensive testing in Hamilton-Wentworth under the auspices of the Municipal and Industrial Strategy for Abatement should produce a substantial database on the true composition of the wastes being discharged into the sewage system.

While in the past little concern was given to industrial polluters using the municipal sanitary sewer system as a conduit for their liquid toxic waste discharges, Regional employees are now empowered to track down and prosecute flagrant abusers of the sewer system using both the new Regional sewer-use bylaw and the regulations included in section 136 of the Environmental Protection Act. Under the terms of Bylaw No. R89-049, a bylaw to regulate the discharge of water and wastes into the sanitary, combined and storm sewer system of Hamilton-Wentworth, industrial firms are not allowed to dump any quantities of PCBs, pesticides, waste radioactive materials, or ignitable wastes including fuels. Certain elements such as copper, cyanide, arsenic and mercury are allowed only in very small quantities for each litre of wastewater discharged. Other criteria such as maximum levels of suspended solids, phosphorus, biochemical oxygen demand, phenols, and temperature were also included. Additional general clauses in the bylaw outlaw the discharge

of any substance that could damage the health of receiving bodies. Thus, virtually any type of undesirable contaminant could be prohibited from the sewer.

The Lab Section of Hamilton's Sewage Treatment Plant has decided to concentrate on the 500 most probable large industrial polluters (of 2,000 local industrial firms), and has sent out surveys to these firms asking for information on their discharges. Unfortunately, to date only a minority of companies has responded, leaving it almost completely up to the Lab Section to identify which contaminants are coming from which industrial dischargers. With approximately 140 contaminants being monitored and many hundreds of industrial firms to scrutinize, the Labs Section will only be able to identify and restrain a portion of those industrial firms that regularly or accidentally dump tonnes of toxic materials into the Regional sewage system. Nonetheless, the spectre of heavy government fines, bad publicity in the local media, and sewage investigators examining their discharges may encourage Hamilton-Wentworth's industrial firms to reduce discharges of dangerous and toxic materials into the sewers through their own initiatives.

3.2.2 - Private Systems:

The current Provincial standards for the establishment of septic systems was developed in the early 1970's and it was assured that they would last in perpetuity. However, preliminary research on the operation of private sewage systems emanating from the U.S. and Canada suggests that effluent from these systems do not perform as traditionally assumed²¹. However, there has been no movement by the Provincial government to update (i.e., study) the existing standards.

The concern is that effluent from septic tanks may contaminate groundwater supply with nitrates and coliforms. This problem can become acute in areas of higher densities of development (e.g., rural settlements) or areas with inadequate soil base which have been developed.

Consultants for the Region of Hamilton-Wentworth, in the past, have carried out "Settlement Capability Studies" in the 1970's and 1980's. These studies are basically hydrogeological studies which determine if there is adequate ground water supply for additional development and recommend appropriate lot sizes for septic systems.

The Region's Official Plan permits various types of development on private services including development in rural settlements; rural residential estate development (i.e., subdivision or minimum 1.5 acre lot) and, on individual lots created by severance. These policies were created with little awareness of the potential impacts of septic systems on groundwater resources.

²¹ Report of Region of Waterloo, 1990

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